Atlantic Flyway Mute Swan Management Plan



Prepared by the Snow Goose, Brant, and Swan Committee Atlantic Flyway Technical Section

Adopted by Atlantic Flyway Council July 2003

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EXECUTIVE SUMMARY

The mute swan is a Eurasian species not native to North America. It was introduced in the late 1800s as a decorative waterfowl for parks, zoos, and private estates. By the early 1900s, small numbers of birds had escaped into the wild, began nesting, and soon established feral populations. Currently, mute swan populations are well established in many states, mainly along the North Atlantic Coast, the Great Lakes Region, and the Chesapeake Bay Area. Populations in the Atlantic Flyway have grown dramatically from less than 1,000 in the mid- 1950's to more than 14,000 in 2002, 2.6 times the number observed in 1986. Growth rates are approximately 6% annually and mute swan numbers continue to grow exponentially, doubling every twelve years. Maryland and Virginia have the highest growth rates in the Flyway.

Mute swans are highly invasive of wetland habitats, impact native species of fish and wildlife, damage commercial agricultural crops, and pose a threat to human health and safety. As such, they cause serious nuisance problems and property damage, including economic loss. Because of their consumption of large quantities of submerged aquatic vegetation and their aggressive behavior, mute swan compete directly with many other water birds and fisheries for critical habitats. Due to their strong territorial defense, some pairs will vigorously defend nest and brood sites from intrusion by other wildlife and have attacked humans, causing serious harm. They do provide some aesthetic value for public enjoyment. But, as populations of mute swans have grown in various states and expanded into new areas, there is a need to coordinate management actions among state/provincial and Federal wildlife agencies to reduce numbers to desirable levels.

The goal of this management plan is TO REDUCE MUTE SWAN POPULATIONS
IN THE ATLANTIC FLYWAY TO LEVELS THAT WILL MINIMIZE NEGATIVE
ECOLOGICAL IMPACTS TO WETLAND HABITATS AND NATIVE MIGRATORY
WATERFOWL AND TO PREVENT FURTHER RANGE EXPANSION INTO
UNOCCUPIED AREAS

Specific management objectives include the following:

- Increase public awareness of mute swans, their status as an introduced and invasive species, and their impacts on native wetland ecosystems and other species of wildlife.
- Reduce the population of mute swans to less than 3,000 birds by 2013 as measured by the Atlantic Flyway Mid Summer Mute Swan Survey.
- Prevent mute swans from further expanding their range and establishing new breeding populations.
- Develop and implement guidelines and regulations for keeping captive mute swans by aviculturists, public zoos, and educational facilities.

• Monitor changes in mute swan numbers and their distributions to evaluate the effectiveness of management actions and develop research programs to assess what effects these changes have on wetland habitats and other wildlife.

For each objective, specific strategies are identified with activities or policies to be implemented or supported by state/provincial and Federal wildlife agencies and non government partners.

INTRODUCTION

The mute swan (*Cygnus olor*), an indigenous species of Europe and parts of Asia, was introduced into North America as a decorative waterfowl for parks, zoos, and private estates during the late 1800's. More than 500 mute swans were imported from 1910 through 1912, and the flight feathers of many of these birds were cut (Phillips 1928). Consequently, small numbers of birds escaped into the wild and began reproducing. These early introductions to the wild are believed to have occurred along the Hudson River in 1910 and on Long Island, New York in 1912 (Bull 1964). Allin (1994) and Allin et al. (1987) reported earliest sightings of feral mute swans by states and provinces (Appendix A). Early sightings of mute swans were met with enthusiasm by birders for the addition of this species to North America's fauna.

Mute swans were seldom recorded during pre-1970s Mid-Winter Waterfowl Surveys (MWS) in the Atlantic Flyway. The first records of mute swans in the MWS were in 1954 and during the early 1960s. Only low numbers of these birds were reported. However, in 1966, the MWS count was over 2,100 mute swans and waterfowl managers first expressed concern over their growing numbers. A general lack of information on mute swan populations in North America prompted early studies by Willey (1968) and Reese (1980), who investigated the biology and population dynamics of the species in Rhode Island and in the Chesapeake Bay region of Maryland, respectively. Both studies found that their respective populations were growing rapidly and recommended initiation of control programs.

As flocks of mute swans in various states grew in number and expanded into new areas, some state wildlife agencies established population control policies and programs in an attempt to manage their flocks. Management on a flyway-wide basis has not been coordinated due to differences between individual state laws that either specifically protected mute swans or classified them as a feral or deleterious species without protection. Mute swans were classified by federal and state wildlife agencies as feral, exotic, and/or an introduced invasive species. But, in absence of any organized control efforts, numbers of mute swans continue to grow and the range within states/provinces is expanding into areas previously unoccupied by this species. Because of its herbivory and its consumption of large quantities of submerged aquatic vegetation (SAV), mute swans can be expected to have deleterious impacts on wetland habitats, and the many other water-birds utilizing these habitats for breeding, staging and wintering.

POPULATION TRENDS

An earlier review of the history of mute swans in the Atlantic Flyway by Allin et al. (1987) predicted that the population would double by the year 2000, based on the mean 5.6% annual growth rate indicated by the MWS (1954-1987). In actuality the Atlantic Flyway mute swan population increased by more than 2.2 times by 1999 to over 12,650 birds (Appendix B; Table B-1). In 1985, the Atlantic Flyway Council (AFC) initiated a Mid-Summer Mute Swan Survey (MSMSS) to document the status and more accurately track the growth rate of this invasive species. This survey is conducted every 3-years

during the birds molt period in mid-July through mid-August. This survey provides a more accurate count because mute swans are the only swan species being observed, unlike the MWS when tundra swans (*Cygnus columbianus*) are present. The first MSMSS was completed in 1986 and thereafter, in 1989, 1993, 1996, 1999 and 2002. These mid-summer surveys indicate an annual mean growth rate of approximately 6% for the Atlantic Flyway, similar to MWS data noted between 1954 and 1987. During the past 16-years, the Atlantic Flyway population has grown 147.3%, equivalent to 2.6 times what it was in 1986. If the current rate of growth continues (Figure 1), the swan population could potentially double every twelve years.

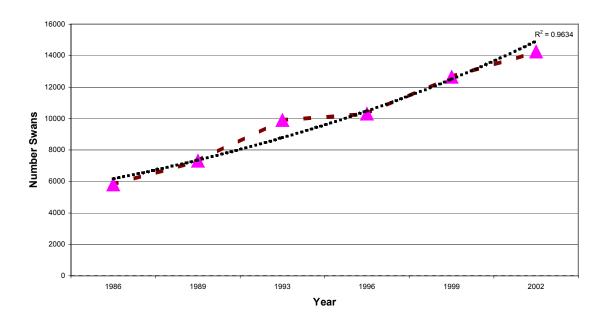


Figure 1. Mute swan population growth in the Atlantic Flyway as indicated from Mid-Summer Mute Swan Surveys (1986-2002) and predicted mean annual growth rate of approximately 6%.

Maryland DNR has developed a population growth rate model to project the changes in mute swan numbers resulting from various management actions (Appendix C.) The model suggests that decreasing adult survival will be much more effective in reducing the Maryland mute swan population than will reducing recruitment through egg addling, oiling or similar techniques. Although the Maryland segment of the mute swan population appears to have a higher growth rate than most other portions of the flyway, it is reasonable to expect that a similar relationship between mortality and recruitment will apply. Without a program of effectively reducing adult survival or using the less effective alternative of nearly eliminating annual recruitment, numbers of this species will continue to increase.

DAMAGES AND CONFLICTS

Detrimental Impacts on Wetland Habitat

In a study on the Chesapeake Bay, Fenwick (1983) found that mute swans could consume on average 43% (females) and 35% (males) of their body weight daily. Based on these calculations, mute swans have the ability to consume more than 8 pounds (3.65 kilograms) of SAV per day. Approximately another 20 pounds per day of SAV may be uprooted during feeding, which can have devastating effects on the viability of aquatic plant beds (Gilham 1956, Willey 1968, Ciarancia et al. 1997). Thus, in an area of high concentrations, mute swans can have a major impact on aquatic ecosystems.

In coastal Sweden, Mathiasson (1973) calculated that 45 mute swans consumed 18,997 pounds (8,635 kilograms) of sea lettuce during a 45-day period, or about 9.4 pounds (4.3 kilograms) per swan per day, and determined that they could eliminate some plant species from an ecosystem.

Netherlands studies by Nierheus and Van Ierland (1978) noted that mute swans were responsible for 87% of the consumption of eelgrass beds used by birds. Chasko (1986) observed significant reductions of SAV in small Connecticut ponds used by breeding mute swan pairs. Reichholf (1984) found that swans removed about 20% of available vegetation within breeding territories. A recent RI study (C. Allin, Rhode Island Department of Environmental Management, personal communication) confirmed previous studies noting overgrazing of SAV by mute swans in ≤ 0.5 meters of water (Gillham 1956, Jennings et al. 1961, Berglund et al. 1963, Willey 1968, Mathiasson 1973, Charman 1977, Nierheus and Van Ierland 1978, Scott and Birkhead 1983, Ryley and Bowler 1994). These earlier studies reported that in some cases swans eliminated individual plant species from some wetlands.

Conover and Kania (1994) reported that mated pairs of mute swans had little or no effect on native waterfowl and their herbivory. Others, however, have noted serious impacts of mute swans on their habitat. Hindman and Harvey, (2003) cite reports of overgrazing SAV by mute swans in local areas and the concerns of residents about the loss of SAV habitat and its impact on blue crab (*Callinectus sapidus*) and fish populations in Maryland. Recent attempts to restore eelgrass (*Zostera marina*) beds in the Chesapeake Bay by the Virginia Institute of Marine Science have been met with increased mute swan feeding activity on those new SAV beds and significant loss of the eelgrass plantings (M. Naylor, Maryland Department of Natural Resources, personal communication).

Furthermore, both European and American studies noted that mute swans fed on the same SAVs used by other waterfowl (Gillham 1956, Jennings et al. 1961, Willey and Halla 1972, Mathiasson 1973, Charman 1977, Nierheus and Van Ierland 1978, Scott and Birkhead 1983, Perry et al. 2003).

Detrimental Impacts on Native Waterfowl

Competition for habitat makes mute swans a threat to native waterfowl. Some swans will tolerate other waterfowl nesting within their territory, however older pairs are less

tolerant (C. Allin, , personal communication). Due to their strong territoriality, some pairs will vigorously defend nest and brood sites from intrusion by other swans, ducks, and geese. They may even kill the intruding pair and/or their young (Stone and Masters 1970, Reese 1980, Kania and Smith 1986). Territorial defense allows a mated pair to protect food resources needed to support offspring.

Year round residency of mute swans on shallow wetlands can reduce SAV availability for native breeding and wintering waterfowl. Krementz (1991) noted that a reduction in wintering black duck (*Anas rubripes*) numbers correlated with the decline of SAVs. Also studies of canvasback (*Aythys valisneria*) and redhead (*Aythys americana*) population declines in the Chesapeake Bay appear to be the results of SAV reductions (Haramis 1991).

Little is known at this time regarding potential conflicts between mute swans and those swans native to North America, (e. g. trumpeter [*Cygnus buccinator*] and tundra swans). Johnson (Kellogg Bird Sanctuary, unpublished report) reported on four anecdotal conflicts between trumpeter swans and mute swans in Michigan during early spring, 1990-1996. In those incidents trumpeter swans prevailed.

There is a concern that the increase in mute swans in Maryland may be contributing to factors that have suppressed population growth among wintering tundra swans. Tundra swans wintering in Maryland have declined about 40% during the past 25 years. The reduced tundra swan numbers in Maryland may be linked to changes in SAV abundance. However, in adjacent states of Pennsylvania and Virginia, and the state of North Carolina, wintering tundra swan populations have increased during the past decades. The time period during which tundra swans remained at lower levels in Maryland coincides with the rapid increase in mute swan numbers in that state. Mute swan pairs have been observed exhibiting aggression toward wintering tundra swans, driving them from foraging areas and protected coves used for winter shelter (L. Hindman, Maryland Department of Natural Resources, personal communication). If mute swans were to adapt to upland feeding behavior, there may be a potential for further interaction with wintering and staging tundra swans.

Detrimental Impacts on Other Wildlife

Mute swans may engage in aggressive behavior towards animals other than waterfowl; a few attacks have been reported on furbearers and small rodents (Ciaranca et al. 1997). The direct effect of mute swans impacting threatened species has been documented where swans caused nest abandonment in a nesting colony of black skimmers (*Rynchops niger*), and least terns (*Sterna antillarum*) on sand bars and beaches in Chesapeake Bay, Maryland (Therres and Brinker 2003).

Loss of SAV also will affect habitat used as shelter and food of fish, shellfish, and macro-invertebrates (Krull 1970, Hurley 1991). Loss or reduction of SAV will have a direct effect on marine fishery nursery habitats within shallow coastal waters.

Detrimental Impacts on Agriculture

Grazing by mute swans on upland grasses and canola crops is a concern to European farmers. Scott (1984) reported on the quality of territory required by mute swans in England and noted the accessibility of upland pasture for grazing as one of four aspects. Others (Gillham 1956, Eltringham 1963, Minton 1971, Bacon 1980, Sears 1989) also note the use of upland pastures and fields of winter wheat and grasses by foraging mute swans. Small numbers of birds have been observed (L. Hindman, Maryland Department of Natural Resources, personal communication) feeding on turf grass and rye grass crops where SAV resources were considered to be limited. Thousands of dollars of damage to commercial cranberry crops has been noted in New Jersey and Massachusetts by mute swans foraging on aquatic plants (C. Allin, personal communication). In British Columbia and Washington State, mute swans have been reported to feed in agricultural fields and cause damage to small grain crops. Should mute swans in the Atlantic Flyway begin feeding on commercial agricultural crops as they have in Europe, they could cause severe agricultural damage.

Nuisance Problems

Mute swans have caused serious nuisance problems and property damage, including economic loss. Territorial defense by mute swans has been directed against humans that approach nests and/or young. A strike with their carpal wing joint is capable of breaking bones and severely injuring the recipient. Allin (1981) reported on mute swans attacking humans. Swan attacks have been known to turn over canoes, kayaks, and small fishing boats. North Carolina had two reported incidents of mute swans attacking people during 2001 requiring one person to seek medical treatment (D. Luszcz, North Carolina Wildlife Resources Commission, personal communication). Connecticut (M. Huang, Connecticut Department of Environmental Protection, personal communication) reported four documented incidents of mute swans attacking people since 2001. An attack on an 81 year-old woman resulted in 31 stitches and failure of her pacemaker. The following year, the same pair of swans attacked her again. Individuals have reported incidents of a mute swan attacking a small dog chained to its doghouse, which was within the birds' territory (C. Allin, personal communication).

Deposition of Canada goose feces has been implicated in the eutrophication of small ponds and lakes as well as contamination of swimming areas, parks, and docks (Conover and Chasko 1985, Cooper and Keefe 1997). Undoubtedly, the same habitat degradation and nuisance problems associated with an abundance of mute swan feces would also apply. The public has expressed concern in most areas with high densities of Canada geese over the possibility of disease transmission to humans from contact with goose feces material or contaminated water (Conover and Chasko 1985, Allan et al. 1995, Cooper and Keefe 1997, Smith et al. 1999, Feare et al. 1999). Although Converse et al. (2001) found relatively little risk of human disease from exposure to Canada goose feces, no studies regarding potential pathogens in mute swan feces have been conducted.

HISTORY OF POPULATION CONTROL AND PUBLIC POLICY

Since the mid 1970s, many wildlife agencies have utilized some form of population control on mute swans in their respective states/provinces. Rhode Island conducted an egg-addling program (1978-2003), destroying over 11,000 eggs. Rhode Island state policy included euthanasia of sick, injured, and nuisance birds and prohibited the sale, import and export of birds or their eggs.

Until recently, Delaware, Pennsylvania, and Virginia considered mute swans as exotic unprotected birds. While Pennsylvania and Virginia allowed mute swans to be shot by hunters, Delaware aggressively removed birds from state lands. New York established a mute swan policy in 1993 that included harassment, egg addling, prohibiting releases, and removal and euthanasia of nuisance birds. In 1997 Vermont established a policy of total removal of all swans from the state, prohibiting the importation and sale of birds, and also required that all captive birds be pinioned, marked for identification, and not allowed to reproduce.

Maryland along with U.S. Fish and Wildlife Service (USFWS) refuges in that state had used egg addling and removal of adult swans from state and federal properties. During the mid-1990s, a New Mexico game breeder removed approximately 250 birds from a local flock that damaged a skimmer and tern colony. Local residents were allowed, by permit, to addle eggs, destroy nests, and shoot problem swans (prohibited in 1998).

Concerns for the impacts on habitats important to migratory birds led the AFC in 1997 to approve and adopt a policy (Appendix E) to control mute swans.

Mute swans in Canada are included under the federal Migratory Birds Convention Act (MBCA), which means that the possession of this species by aviculturalists is controlled, and the release of mute swans into the wild is prohibited. Also, this prevents wild swans from being taken by any means, except under a permit issued by the Canadian Wildlife Service (CWS). The CWS is currently issuing permits to its staff to control mute swans on National Wildlife Areas. In 1999, the Atlantic Region of CWS prepared a policy on mute swans. This action was taken prior to any establishment of a feral population, and the policy is now being extended to include all of Canada. There are no feral mute swan populations in the Atlantic Region (which includes Newfoundland and Labrador, Prince Edward Island, Nova Scotia and New Brunswick). Any captive birds must be maintained under an aviculture permit with strict guidelines which must be followed and periodically reviewed.

In 1998, the USFWS issued a policy statement directing refuge managers on National Wildlife Refuges in Regions 1-7 to take effective steps to control mute swans and prevent destruction and degradation of wetland habitats.

In 1999, the President of the United States signed Executive Order 13112 on Invasive Species. This defined Invasive Species, viz. an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health, and directed all federal government agencies to prevent the introduction of invasive species and provide for their control. It also was intended to minimize the economic, ecological, and

human health impacts that invasive species cause and to refrain from actions likely to increase invasive species problems.

In 2001, the U.S. Court of Appeals (Hill vs. Norton, U.S.D.I. et al. 12/28/01) ruled that, as a "swan" and a member of the family "Anatidae" and further, inclusive in the migratory bird conventions with Canada, Mexico, and the United States, the mute swan is under the jurisdiction of the Migratory Bird Treaty Act of 1918 and therefore, a Federally protected species.

In 2002, the USFWS issued guidelines regarding permitting requirements to control mute swan populations, including depredation permits or establishment of a depredation order. The USFWS began issuing depredation permits to individual states for mute swan population control efforts, upon request. In 2003, a draft EA was prepared to support issuance of these permits, in response to a lawsuit, challenging USFWS actions.

ATLANTIC FLYWAY MANAGEMENT GOAL

THE MANAGEMENT GOAL IS:

TO REDUCE MUTE SWAN POPULATIONS IN THE ATLANTIC FLYWAY TO LEVELS THAT WILL MINIMIZE NEGATIVE ECOLOGICAL IMPACTS TO WETLAND HABITATS AND NATIVE MIGRATORY BIRDS AND TO PREVENT FURTHER RANGE EXPANSION INTO UNOCCUPIED AREAS.

Rationale: The mute swan is an invasive species not native to North America. Unfortunately, introductions of this species in the late 1800's, did not consider detrimental effects on native species of migratory waterfowl and other wildlife. These effects include but are not limited to direct territorial aggression and competition for habitat resources. These conflicts with native wildlife are in addition to those stresses caused by expanding human populations in the eastern United States and Canada. Additionally, there is increasing potential for conflicts with agriculture, fisheries and other human uses.

Proper stewardship by wildlife agencies demands that invasive species like the mute swan should not be allowed to adversely impact indigenous wildlife species sharing similar ecological niches. This Management Plan recommends that feral populations of mute swans within the Atlantic Flyway be reduced to prescribed target levels believed to provide some opportunity for viewing within limited areas, while minimizing negative impacts to native plants and animals. Expansion of the core breeding population into areas now having relatively small numbers of individuals and breeding adults is unacceptable. States and Provinces should be given the necessary tools to ensure that they can meet their objectives for mute swans within their borders. Population objectives may be reassessed and adjusted following the timeframe of this Plan.

MANAGEMENT OBJECTIVES AND STRATEGIES

OBJECTIVE A: <u>Increase public awareness of mute swans, their status as an invasive species, and their impacts on native wetland ecosystems and other species of wildlife.</u>

Strategy A-1: Develop and implement a comprehensive mute swan communication program for the Atlantic Flyway working closely with individual states and provinces.

A critical need exists to increase public awareness of the need for maintaining and enhancing interrelationships between native wildlife and habitats. Many people do not comprehend the basic difference between indigenous species and introduced exotics like the mute swan, which was introduced merely for ornamental purposes. The failure of some publics, particularly those in urban settings, to readily discern between species that constitute the critical components of native ecosystems and those species misplaced by man that conflict with the working of these ecosystems is increasing. This hampers efforts to conserve native species and their habitats. Every effort must be made by all jurisdictions to provide these facts in a manner tailored to each individual demographic group. Also, communication programs must convey impacts of mute swans on native resources, need for management actions, adverse impacts of releasing mute swans, and winter feeding.

Strategy A-2: Survey public attitudes on mute swans, management programs, and the effectiveness of outreach programs.

Feedback from the public is necessary to evaluate effectiveness of public outreach and of management programs.

OBJECTIVE B: Reduce the population of mute swans in the Atlantic Flyway to less than 3,000 birds by 2013 as measured by the Atlantic Flyway Mid Summer Mute Swan Survey.

The upper limit of 3000 swans represents the maximum desired level based upon consultations between federal, state, and provincial wildlife agencies within the forum of the AFC. Individual state and provincial targets are presented in Appendix D. Individual state/provincial target levels range from 500 individuals in Massachusetts, New York, and New Jersey to zero or near zero individuals in other states/provinces (ME, NH, DE, NC, SC, GA, FL, NF, NB, NS, PE, QC)

Strategy B-1: Remove adult mute swans and/or reduce the annual survival rate of adult birds using direct population control methods by agencies or through regulated hunting seasons by the public.

Removal of adult breeding birds from the population either by humane capture and euthanasia or by a combination of humane capture and euthanasia and hunting is the most effective way to reduce numbers of mute swans in the Atlantic Flyway to acceptable levels. Although regulated hunting by the public is a preferred method of controlling overabundant wildlife populations, many mute swans occur in areas such as urban sites

where hunting by the public is not considered feasible. These areas will require direct intervention by personnel of wildlife agencies or authorized individuals. Many of the states/provinces in the Atlantic Flyway already had humane control programs in place prior to the 2001 U.S. Court of Appeals ruling. These programs can be reactivated under a federal depredation order.

Because the mute swan is in the family Anatidae it is regulated as a game bird under the Migratory Bird Treaty Act. Those states wishing to employ a mute swan hunting season to help meet population target levels should be given authority to do so by the USFWS. Hunters in those states with existing tundra swan seasons, should be allowed to legally harvest mute swans during those seasons.

Strategy B-2: Continue to reduce recruitment of mute swan populations through egg treatment programs.

Although not as effective as direct mortality of adults in reducing mute swan numbers, egg treatment programs can contribute to reaching population target levels. They often can be applied in areas where humane removal of adult birds is not feasible or acceptable to the local public.

Strategy B-3: Implement a general depredation order for control of mute swans in the Atlantic Flyway.

Issuance of federal permits for removal of mute swans within states and on federal refuges should be a priority for the near term. States should make application to the Service for depredation permits to use lethal and non-lethal methods of control. A general depredation order by the USFWS would enable individual states to proceed with necessary management actions specified in this Management Plan. Such a Depredation Order currently exists in the U.S. portion of the Atlantic Flyway for other migratory game birds, e.g., crows and double-crested cormorants. Such a Depredation Order would provide greater opportunity for citizens and other entities to resolve swan conflicts and thus reduce State manpower and related costs required to provide technical assistance. A Depredation Order would be especially beneficial to property owners who encounter swans that pose a risk to human safety and prevent people from utilizing their shoreline property and riparian waters, enabling them to resolve the problem quickly. The current Federal Depredation Permit process is inadequate in providing citizens with quick relief from such conflicts.

Strategy B-4: States with legislation in place that prohibits mute swan control options should seek to have this legislation recalled or modified.

Achieving and maintaining flyway populations at desired levels will require earnest commitments from all states, provinces, and federal governments. Areas that maintain large populations of mute swans will potentially serve as sources, resulting in immigration into areas where they are unwanted.

OBJECTIVE C: <u>Prevent mute swans from further expanding their range and from occupying areas with important ecological values.</u>

Strategy C-1: Prohibit relocation and release of any mute swans within any area of any state/province of the Atlantic Flyway.

State and/or provinces that currently do not have free ranging mute swans need to prevent the establishment of breeding populations within their borders. Also, those with existing breeding populations must stop mute swans from spreading into new areas. This will require some states to develop strategies and implement control programs.

Strategy C-2: Areas with higher potential for ecological or sociological conflicts should be given highest priority for population reduction programs prescribed to satisfy Objectives A and B.

Targeting population segments that have the greatest potential for creating conflicts with other wildlife, endangered species, fisheries, and human users is the quickest way to resolve these conflicts in states and provinces that have population targets greater than zero.

Strategy C-3: Develop and implement a full range of non-lethal techniques to discourage use by mute swans in sensitive areas where population reduction is not appropriate.

Population control is the preferred method of reducing swan use of sensitive ecological areas. However, population control is not always appropriate or feasible due to sociological considerations. These situations require application of effective harassment techniques designed to discourage swan use.

OBJECTIVE D: Develop and implement guidelines and regulations for keeping captive mute swans by aviculturists, public zoos, and educational facilities.

Strategy D-1: Develop jurisdictional policies for possession of mute swans in captivity.

Zoos, educational and research facilities, private aviculturists and other similar users have a need or desire to hold mute swans in captivity. A policy which defines these users and establishes stricter guidelines and requirements for ownership of mute swans is needed. Any mute swans kept in a free-range setting must be marked, pinioned or otherwise rendered flightless and sterilized to ensure recognition and recovery of escaped birds. Managers exhibiting mute swans need to inform the public of the negativity associated with introduced invasive species in the wild.

Strategy D-2: Consider stricter federal and state penalties and improve enforcement for non-compliance with regulations for keeping mute swans in captivity and unlawful release of mute swans into the wild.

The public generally has ignored agency recommendations and regulations regarding unauthorized release and feeding of nuisance wildlife. Likewise wildlife agencies have not vigorously enforced and prosecuted violations of permitting and nuisance wildlife regulations. The impacts of invasive and nuisance wildlife such as the mute swan are

serious enough to demand a vigorous approach to managing public complicity in these impacts. Failure to take a firmer stand will result in failure to manage invasive species and furthermore will violate Executive Order 13112.

OBJECTIVE E: Monitor changes in mute swan numbers and their distributions to evaluate the effectiveness of management actions and develop research programs to assess what effects these changes have on wetland habitats and other wildlife.

Strategy E-1: Conduct the Atlantic Flyway Mid Summer Mute Swan Survey a minimum of every three years.

The MSMSS is the established index to mute swan populations in the Atlantic Flyway. Although mute swans are surveyed in the annual Mid-Winter Waterfowl Inventory (MWI), the MWI is not designed to provide a total count of mute swans, does not cover all areas where mute swans are found, and may be confounded by the presence of other swan species.

Strategy E-2: Incorporate use of GIS technology during the MSMSS to more accurately measure changes in distribution of mute swans within the Atlantic Flyway.

Continuous monitoring is recommended to further substantiate the effect that mute swans have on habitat, numbers of birds necessary to effect habitat quality, and impact on resident and wintering waterfowl numbers and populations. This technology is currently available and has been used in a number of waterfowl surveys by state, provincial and federal agencies. By monitoring spatial distribution of mute swans as well as numbers of birds, we can better measure the effects of management practices. This is especially helpful in evaluating impacts on SAV beds and other resources and compliance with release regulations.

Strategy E-3: Continue research to evaluate the effects of mute swans on migratory birds, their habitat and other indigenous living resources as well as management programs associated with this plan.

A better understanding of the effects of invasive species like the mute swan on native ecosystems is essential to improving management programs and enhancing public outreach. Information on such factors as population ecology of mute swans, conflicts with other species and impacts on SAV and other habitat factors is needed. Also needed is documentation of nuisance complaints. Surveys of public attitude would be helpful in determining success of management efforts.

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APPENDICES

Appendix A

Table A-1: Earliest known sightings of mute swans within states and provinces in the Atlantic Flyway

State/Province	Year	State/Province	Year
New York	1910	Quebec	1965
New Jersey	1919	New Hampshire	1967
Massachusetts	1922	West Virginia	1986
Rhode Island	1923	North Carolina	1989
Pennsylvania	1930's	Georgia	1989
Ontario	1934	Maine	1990
Virginia	1955	South Carolina	1993
Maryland	1954	New Brunswick	1993
Connecticut	1957	Vermont	1993
Delaware	1958		

Appendix B

Table B-1. Mute Swan Mid-Summer Survey results by region in the Atlantic

Flyway, from 1986 to 2002, by 3-year periods.

Region	1986	1989	1993	1996	1999	2002	% Change 1986-2002
Ontario:							
Lower Great Lakes	615	811	1100	1200	NS	1373	123.3
New England:							
Maine	3	12	6	8	7	0	NA
New Hampshire	19	0	49	30	31	42	121.0
Vermont	0	0	4	11	0	0	NA
Massachusetts	585	565	660	917	986	947	61.9
Rhode Island	880	1044	1333	1206	1577	1367	55.3
Connecticut	1452	1948	1707	1589	1609	1338	-7.9
Subtotal:	2939	3569	3759	3761	4210	3693	25.7
Upper Mid-Atlantic:							
Delaware	21	1	21	9	27	18	-14.3
New York	1815	1966	2069	1644	2429	2848	56.9
New Jersey	529	717	893	1019	1364	1602	202.8
Pennsylvania	63	122	139	253	242	348	49.2
Subtotal:	2439	2806	3122	2757	3953	4816	97.5
Chesapeake Bay:							
Maryland	264	611	2245	2717	3955	3624	1272.7
Virginia	60	145	231	419	488	563	838.3
Subtotal:	324	611	2245	3136	4443	4187	1192.3
Southeastern:							
West Virginia	0	0	2	6	9	17	NA
North Carolina	0	6	29	5	18	14	NA
South Carolina	3	0	3	0	0	27	NA
Georgia	0	26	NS	NS	0	1	NA
Florida	NS	46	(1000)	(1000)	(1000)	215	NA
Subtotal:	0	78	32	11	27	274	NA
Total:	5800	7308	9888	10268	12643	14344	147.3
() = privataly aymad	NT A	not oppli	1.1	NIC	urvov oondi	41	

() = privately owned but free ranging NA= not applicable

NS= no survey conducted

Appendix C

GROWTH RATE MODEL OF MARYLAND'S MUTE SWAN POPULATION

A mathematical model of Maryland's mute swan population using current demographic information was constructed to project the affects of various management actions. The model allows a comparison of how changes to the reproductive output or survival rates influence the growth rate and size of a population (Figure C-1). The model was run at different levels of hatching success to simulate various levels of egg addling effort. The simulations indicated that it is necessary to reduce hatching success by 80% just to stabilize the Maryland population. Further noted is that a 20 percent annual reduction in the adult survival rates resulted in a decrease in the population over time. Maryland's mute swan population growth rate is greater than the Atlantic Flyway's growth rate in general (Table 1.). Thus, the model may tend to overestimate the Flyway's population growth rate.

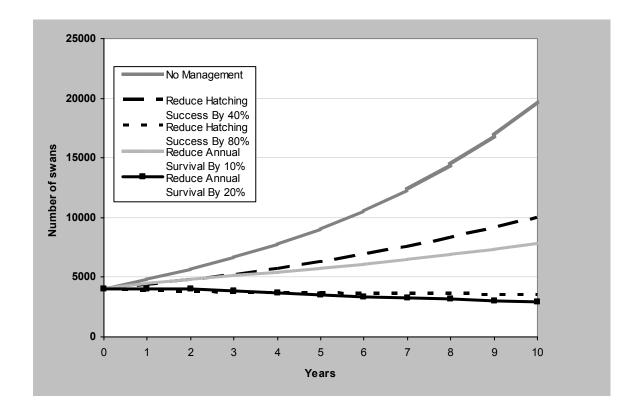


Figure C-1. Projected Mute Swan Population Growth in Maryland Under Different Management Strategies (Maryland DNR Statewide Mute Swan Plan 2003).

Appendix D

Table D-1. Estimated population from the 2002 Mid-Summer Mute Swan Survey and state target population.

Region	Estimated 2002	Target
	Population	Population
New England		
Maine	0	0
New Hampshire	42	0
Vermont	0	0
Massachusetts	947	500
Rhode Island	1367	300
Connecticut	1338	200
Subtotal	3663	1000
Upper Mid Atlantic		
New York	2848	500
Pennsylvania	348	0
New Jersey	1602	500
Delaware	18	0
Subtotal	4816	1000
Chesapeake		
Maryland	3624	< 500
Virginia	563	100
Subtotal	4187	<600
Southeastern		
West Virginia	17	0
North Carolina	14	0
South Carolina	27	0
Georgia	1	0
Florida	215	0
Subtotal	274	0
Total U. S.	12971	2600
Atlantic		
Newfoundland /Labrador	0	0
New Brunswick	0	$\overset{\circ}{0}$
Nova Scotia	0	0
Prince Edward Island	0	0
Subtotal	0	0
Ontario/Quebec		
Quebec	0	0
Ontario	1373	To Be Determined
Subtotal	1373	-
Total Canada	1373	_

Appendix E

ATLANTIC FLYWAY COUNCIL MUTE SWAN POLICY

August 1, 1997

- 1) State wildlife agencies should obtain the authority over sale and possession of mute swans and their eggs.
- 2) The sale of mute swans, their young, or eggs should be prohibited.
- 3) Eliminate all importing and exporting of mute swans without a special purpose permit issued by a state's wildlife agency.
- 4) Mute swans captured due to nuisance complaints, sickness, or injury should be removed from the wild or be euthanized.
- 5) Where feasible, egg-addling programs should be established.
- 6) State and federal wildlife agencies should institute programs to prevent the establishment and/or eliminate mute swans.
- 7) States and provinces should seek to make the mute swan an unprotected species if this is not already the case.
- 8) States should strive to manage mute swan populations at levels that will have minimal impact to native wildlife species or habitat.

Appendix F

Historical Perspectives on the Status and Management of Mute Swans in Canada and the United States

CANADA

Atlantic Provinces

Nova Scotia, New Brunswick, Newfoundland, Labrador, and Prince Edward Island have agreed to the policy established by the Canadian Wildlife Service for the Atlantic Region.

Ouebec

Free-flying mute swans have been observed in Quebec since 1965. For the next 30 years, up to 40 observations have been reported. Since 1987, the numbers of birds in the wild are increasing. There are two breeding records, one in 1978 and the other in 1995. These birds were of unknown origin but had probably escaped from aviculturalists, or were expansions from wild populations now well established in the U.S. and in southern Ontario. Currently, there are 110 captive birds maintained under aviculture permits in Quebec. Those birds are maintained in enclosures but as yet there are no special conditions (such as banding) such as those imposed in the Atlantic region. A revision of the regional policy on aviculture will be started soon, and will include the mute swan. The population goal for Quebec is zero birds.

Ontario

The first free-flying mute swan observed in Ontario was seen in 1934 at Long Point. The first breeding pair in Ontario was recorded in 1958 at a golf course near Georgetown, but larger scale colonization began in the lower Great Lakes in the mid-1960s and 1970s. Since that time, breeding and wintering populations have become well established throughout Ontario's lower Great Lakes coastal regions. Based on data from the Ontario Breeding Bird Atlas from 1981-1985, and anecdotal evidence since then, mute swans breeding in southern Ontario are still concentrated in coastal wetlands associated with the Great Lakes, especially lakes St. Clair, Erie, and Ontario. While it is not known how many birds emigrate from Canadian waters during winter, large numbers of mute swans are counted on the Niagara and Detroit Rivers during the annual Midwinter Waterfowl Survey. During the 2002 Mid Summer Survey, 1369 Mute swans were counted between the St. Lawrence River and Lake St. Clair. As not all habitats were thoroughly surveyed, this can be considered a conservative estimate of Ontario's summer population. There are currently up to 600 mute swans held in captivity under aviculture permits.

Petrie and Francis (2003) reviewed three independent historical data sets (Canada Christmas Bird Counts, 1970-1999; Midwinter Waterfowl Inventory of the Canadian side of Lake Ontario, 1980-2000; and Long Point, Lake Erie spring and fall aerial surveys, 1971-2000) to estimate rate of mute swan population change on the Canadian side of the lower Great Lakes. The average estimated population growth rate varied from 10% per year to 16% per year, depending on the data set. The most conservative growth rate estimate of 10% per year indicates a doubling of the Mute swan population every 7-8 years. These high growth rates indicate that mute swans have found a favorable environment in the lower Great Lakes. It is climatically similar to their native range in Europe, with low natural predation rates and minimal human interference. If the carrying

capacity of the lower Great Lakes for mute swans is similar to portions of the species native European range, we could expect that, at present growth rates, the population could reach 30,000 birds within 30 years or less.

Presently, the Canadian Wildlife Service issues permits to CWS staff to control mute swans on National Wildlife Areas as well as to landowners that demonstrate a need to control Mute swans on their property. However, Ontario does not yet have a management goal for Mute swan numbers on the lower Great Lakes. The Long Point Waterfowl and Wetlands Research Fund has initiated studies pertaining to dietary intake and nutrient reserve dynamics throughout the annual cycle. This work may be expanded in future to study the impact of mute swans on SAV beds in Great Lakes coastal wetlands.

UNITED STATES

Maine

Feral mute swans are rare in Maine with only 2-3 pairs reported in the wild near the towns of Eliot and Kittery, adjacent to the New Hampshire border. The Department of Inland Fisheries and Wildlife has taken action to prevent expansion of mute swans' range in Maine by routinely denying request for the importation and release into the wild.

Three mute swans were recorded in the Piscataquis River (ME/NH border) on the 2002 Midwinter Waterfowl Survey. These birds are believed to be breeding birds mentioned above. Although there is no state management plan written for this species, a mute swan population goal would likely be zero.

New Hampshire

The New Hampshire Fish and Game Department considers mute swans to be feral-domesticated waterfowl. State Fish and Game rules allowed private ownership of mute swans providing that adults and progeny do not leave the landowners property and all birds in captivity must be marked. The Fish and Game Department has no formal written Mute Swan Policy.

The Department receives annual complaints from fishermen and canoeists who have been harassed by territorial male mute swans. In 1995, the Department began control efforts in order to begin addressing public safety issues associated with territorial swans and to limit the number and distribution of the swan population and its impact on native waterfowl species. Since control efforts were initiated, the number of nesting mute swans appears to have stabilized. In addition to egg control, adults are removed from certain public lands and from certain private lands at the request of the landowner.

The Fish and Game Department's goal is to achieve zero breeding population growth and distribution.

Vermont

The position of Vermont Department of Fish and Wildlife is to prohibit the further establishment of new or existing captive flocks and to prevent the establishment and expansion of wild mute swans in Vermont.

Importation and possession of mute swans, or their eggs is prohibited. However, birds being held in captivity prior to the establishment of this position are permitted under the

following conditions: 1) A permit will be issued identifying each individual bird; 2) All birds must be pinioned to prevent them from flying; 3) Birds will not be allowed to reproduce successfully; 4) All eggs produced by captive swans must be shaken, punctured, or coated with mineral oil to prevent hatching; 5) Birds cannot be sold or given away in-state. Birds and eggs held in captivity without a permit will be destroyed. Until recently, the Department policy was to remove all mute swans, including nests and eggs, from lands and waters of the state, and from other public and private properties with the consent of the landowner. Vermont wishes to maintain a zero population of mute swans.

Massachusetts

In 2002, Massachusetts had an August population estimate of 947 mute swans, an increase of nearly 400 birds since 1986. The mute swan has extended its range in the state from southeastern coastal areas northward along the coast to New Hampshire, and is spreading inland. It is now common throughout Bristol, Plymouth, and Norfolk counties in southeastern Massachusetts. It is increasing rapidly in Middlesex and Essex counties in eastern Massachusetts. Swans are also nesting in several areas in Worcester County in Central Massachusetts. Several pairs of mute swans now breed successfully in the Connecticut River valley and swans are occurring in western Massachusetts, but are not yet well-established breeding birds. Population objectives are to restrict the spread of mute swans in Massachusetts with a population goal of not more than 500 birds.

Connecticut

Swans are found in every county in Connecticut. The 2002 MSMSS indicated a minimum estimate of 1,338 swans. Coastal Connecticut and the major river systems harbor the highest densities of swans. The lower Connecticut River from Salmon River Cove to the mouth, the Pawcatuck River and the Thames River hold the highest summer concentrations of swans in the State, approximately 65% of the total population. Swans have greatly expanded their inland range and are now present as far north as Sharon and Salisbury in the northwest part of the State and in the northeast corner in Woodstock. The largest concentrations of inland swans are currently found in the Avon-Harwinton corridor.

Presently, there are no mute swan population control measures in Connecticut. Although the hunting of mute swans is prohibited by law (Section 26-94 C.G.S.), the Commissioner of Environmental Protection has authority to implement control measures for mute swans pursuant to Section 26-3 C.G.S.

From an ecological perspective, the Bureau of Natural Resources (BNR) and wildlife conservationists would prefer to have no mute swans within Connecticut's borders. However, because a segment of the public enjoys viewing swans and they can exist in low value habitats without being detrimental to native plants, wildlife and natural ecosystems; the BNR has established a population objective of approximately 190 birds. This number was developed on the premise that: 1) swans will be excluded from all high quality habitats (Federal, State and private lands) that are specifically managed for biodiversity including, but not limited to, Wildlife Management Areas and Natural Area Preserves; and, 2) limited numbers of swans will provide viewing opportunities for the

public in habitats of low value to native wildlife (i e public parks, large lakes and private ponds).

Rhode Island

Efforts to control the mute swan population have been ongoing since 1976. After 10,500 eggs addled, the RI mute swan population continues to grow at 5.6% annually. Although the control efforts have remained constant, nest numbers have increased, resulting in a decrease in percentage on the estimated number of nest controlled from 80% to 68%. An evaluation of 22 years of mute swan management in RI (Allin and Husband, 2003) concluded that without a broader effort, the program had only slowed the population's growth rate. Annual cost of control is conservatively estimated at \$8,000.

The mute swan population is approximately 1500+ birds (MSMSS) and the breeding population is increasing. It is estimated that in order to manage the population at its current level, management efforts would need to be directed at 90-95% of all nests and cost would likely increase to over \$10,000 annually. It is believed that this may be an impossible goal with current staff numbers. RI's mute swan population goal is 300 birds.

New York

New York has a mute swan population of approximately 2,800 birds (2002). A mute swan management policy was established in 1993. Where mute swans have existed in New York for many years, environmental groups, local officials and residents have advocated a control program. Control of mute swans will best serve the public interest in this species over the long term. Successful nesting by mute swans should be prevented wherever conflicts with other wildlife or human activities may occur. Measures that may be used to control swans include harassment (scaring the birds away), egg shaking, sterilization, and removal. However, a permit is required before any such action is taken. DEC will not allow mute swans to remain or become established on areas it manages.

DEC believes that the public's desire to observe mute swans can be largely met with a smaller feral population and by controlled use of captive birds. Therefore, properly licensed individuals will be allowed to keep, raise, and display mute swans, as long as no birds are released or escape to the wild.

DEC suggests a management objective of no more than 500 free-flying mute swans in the state, with no successful nesting by mute swans living in the wild. This is approximately the number of mute swans that existed in New York during the mid 1970s.

New Jersey

A total of 1,602 mute swans were counted in the last survey conducted in New Jersey during 2002. The number of mute swans has increased 203% since this survey began in 1986 with a growth rate of 12.6% per year. Mute swans are well distributed through the state but are most abundant in park ponds and small lakes in northern New Jersey as well as coastal ponds and impoundments along both the Atlantic Coast and Delaware Bay. The Division has not conducted any population control efforts regarding mute swans. The Division's Wildlife Control Unit generally receives 10 or fewer complaints annually regarding mute swans. Most complaints involve fear of nesting swans that aggressively defend their territories.

The New Jersey mute swan population objective is 500 swans statewide. Populations should be particularly reduced in coastal impoundments managed for migrant and wintering waterfowl.

Pennsylvania

Mute swan numbers are monitored by the Pennsylvania Game Commission (PGC) as part of the MSMSS. Total numbers of mute swans observed in the MSMSS were similar for the 1986, 1989, and 1993 surveys, averaging 133 swans, but increased to approximately 250 swans in 1996 and 1999 and increased again to nearly 350 total mute swans in 2002. The highest concentrations of mute swans in Pennsylvania (approximately 2/3 of the state population) are found in the southeastern part of the state, with additional mute swans occurring in widely scattered locations statewide.

Currently, Pennsylvania does not have a formal policy in regard to mute swans and has no regulations restricting their import, export, sale, or release. Historically, the Pennsylvania Game and Wildlife Code has followed the Migratory Bird Treaty Act in classifying mute swans as a non-protected species.

The population objective for feral, free-ranging mute swans in Pennsylvania is zero and a maximum population of 250 legally permitted swans held in captivity. Persons properly licensed will be able to possess mute swans subject to state and federal regulations. This level will provide for some recreational viewing opportunities for the public on areas not managed for biodiversity and where there is no threat to native plants or wildlife.

West Virginia

The mute swan is rare in West Virginia but numbers have been increasing in recent years. Free ranging birds were first detected in 1986 when four mute swans were reported during the MSMSS. Fourteen birds were observed during the 2002 MWI. Most of the mute swans observed so far have been either in the eastern panhandle or on the Ohio River.

No ecological or public safety issues have been noted to date but should be expected if the population continues to grow. No state specific survey or research projects are in place or contemplated. West Virginia prefers a population of zero free ranging mute swans.

Maryland

The mute swan population in Maryland's portion of the Chesapeake Bay originated when five birds escaped from an aviculture collection along the Miles River in Talbot County in March 1962. Until the mid-1980's, the swan population grew slowly and remained at <500 swans. However, swan numbers increased from 264 in 1986 to 3,955 in 1999. The population increased at an annual rate of about 23% from 1986-99 and 12% from 1993-99. The 2002 MSMSS shows a population of 3,624 birds. The reduced rate of increase since 1993 can be attributed, in part, to limited population control by the DNR and Federal National Wildlife refuges and adult birds removed for scientific research.

The new Federal status notwithstanding, in Maryland, mute swans are regulated as Wetland Game Birds. The DNR has the authority to regulate the possession, sale, trade,

exportation, and importation of mute swans in Maryland. In 2001, Maryland Natural Resources Article, Section 10-211 required the DNR to establish a program to control the population of mute swans and authorizing the Department to include the managed harvest of adult mute swans in this program. A Mute Swan Task Force appointed by the DNR has prepared management recommendations for this nonnative species. The cornerstone of the Task Force recommendations was the delineation of "Swan Free Zones" to exclude or remove mute swans from sensitive habitats and Bay resources. In 2002, a Joint Legislative Resolution by the Maryland Legislature urged the USFWS to act with expedience to craft and conduct appropriate regulatory processes which will allow the DNR to establish a method of controlling the mute swan population and to mitigate the mute swan population's impact permanently and statewide.

The presence of a large mute swan population in the Bay is in conflict with the public policies aimed at restoring the Chesapeake Bay. The population level at which key natural resources will be adequately protected is unknown. However, when the state's mute swan population was <500 birds, adverse ecological impacts and conflicts between people and mute swans were negligible. The accomplishment of this objective will require reducing the size of the mute swan population. The Department has established a state wide Management Plan (April 13, 2003). The goal of the plan is to manage the mute swan population at a level that minimizes the impacts of mute swans on native species and habitats.

Delaware

The mute swan was listed as an unprotected-invasive species in Delaware. As such, mute swans, their nests, and eggs have been routinely removed from State wildlife management areas and (with landowner permission) from private lands since the early 1970s. The state management program has kept the mute swan population at very low numbers in Delaware. Approximately 20-35 birds are removed each year and all nests located are destroyed. The state population is usually less than 60 birds. The state population fluctuates each year in the fall as birds from adjacent states move into Delaware

The bulk of the mute swan population is located on an impoundment leased to the Delaware Division of Fish and Wildlife by the Army Corps of Engineers on the Chesapeake and Delaware Canal Wildlife Area. The balance of the birds are scattered on impoundments along the Delaware coast. The Delaware Division of Fish and Wildlife has a mute swan population objective of zero birds.

Virginia

Mute swans were reported in Virginia in the 1950's and 1960's. Most were in private waterfowl collections, although some were released into the wild. A feral breeding population of mute swans was probably not present until the late 1960's or early 1970's, and mute swan numbers remained low until the 1980's. A survey conducted in the summer of 1986 counted 60 mute swans in Virginia, of which most were associated with private collections.

Mute swan numbers have increased substantially during the past 10-15 years. The most recent survey, conducted in 2002, indicated there were over 560 mute swans in Virginia.

This increase has come from a number of sources including escapees from private collections, progeny of these and other feral breeding swans, recent releases by private landowners (collectors, homeowners, golf courses, etc.), and birds moving into the state from other areas, most notably from further north in the Chesapeake Bay. Many of the swans are located on inland waters near areas where they have been released. However, swan numbers are increasing in coastal areas also. A fast growing segment of this population is located on the islands/marshes in the Chesapeake Bay near the Maryland border where groups of 30-50 mute swans have been counted in recent years.

The impacts that mute swans have on native wildlife, aquatic vegetation, and conflicts with human populations have led to concerns about their numbers and distribution in the state. The presence of mute swans in Virginia is in conflict with public policies aimed at restoring the Chesapeake Bay and other wetland habitats throughout the state. The mute swan was listed as an exotic species in Virginia until 2002. However, because of the change in federal status in 2002 that now affords protection to the mute swan, it was recently removed from the Virginia Nuisance Species list. Prior to this change, control of mute swans, including egg addling and removal of adult birds, had been conducted on Federal Wildlife Refuges, State Wildlife Management Areas, military installations and private lands. In addition, some mute swans were taken during the tundra swan hunting season and other waterfowl hunting seasons. Landowners must now obtain a federal permit to conduct mute swans control activities. However, few citizens are likely put forth the effort required to obtain a federal permit, and many of these mute swan control activities are likely to be reduced.

A statewide population of less than 100 mute swans is desired. In addition, mute swans should be removed or their numbers reduced wherever conflicts with wildlife populations, native habitats, or human populations may occur in Virginia. Public desires to observe swans can be met by observing captive mute swans or the larger number of native tundra swans that spend the fall and winter in Virginia. Efforts to control mute swans should include egg addling and removal of adult birds. Outreach programs to educate the public about mute swans and their impacts on the environment should be enhanced.

North Carolina

The mute swan population level is less than 30 birds. As yet, a breeding population has not been established. The desired population goal is zero birds in the wild

South Carolina

The mute swan population in South Carolina is less than 30 birds, and is considered uncommon. The desired population goal is zero birds in the wild, however there are no plans at this time to manage mute swans.

Georgia

There are approximately 250 mute swans in the state and all are believed to reside on private lands. The current population goal on public waters is zero. There is no current research on mute swans, and no management issues. The only management strategy is to limit the mute swans to private ponds only, and prevent their establishment on public waters.

Florida

The Florida Fish and Wildlife Commission (FWC) is currently aware of 219 mute swans residing within Florida. All but 4 of these are known to be captive and pinioned. However, given the large number of up-scale resort and residential developments, we suspect that the captive population may number in the thousands and may be possibly increasing due to continued human development. Although the captive population is a likely source of birds for a feral population, we have no evidence of a significant feral population because biologists have observed no mute swans in "wild" habitats. A source of feral mute swans has existed for many years with no apparent establishment of a feral population. This situation suggests that the potential for rapid growth of a feral mute swan population in Florida is low.

The FWC has no policy explicitly pertaining to mute swans. However, rule 68A-4.005 of the Florida Administrative Code states that it is illegal to possess, transport, or otherwise bring into the state or to release or introduce in the state any wildlife or freshwater fish that is not native to the state unless such person shall first secure a permit from our agency. This prohibition would apply to mute swans.

There are no strategies in Florida to address ecological and public safety impacts because there is no need for this action. Nor is there a policy for a wild mute swan population level.

Appendix G

Natural History

Longevity

Swans are capable of breeding by their third spring and will continue throughout their life. Approximately 59.7% of mute swan broods survive during the first year of life (Allin et al 1987). Survival of mute swans may fluctuate annually depending upon winter severity and available food sources. Annual survival rates increase with age (Reese 1980, Gelston and Wood 1982). Reese (1980) reported a post-fledging survival rate average of 90% to year 1 and a 50% survival rate to age 7. Mute swans in Michigan had been reported to have a 12-16% annual mortality rate after fledging to their 3rd year, a 2-7% annual rate from 4 to 8 years, and only 2% annually after age 5 (Gelston and Wood 1982). Life expectancy in the wild may reach to over 25 years; however, the average is probably closer to 7 years (Reese 1980).

Mortality

Mute swans have few predators other than humans. There is no mute swan hunting season in North America, although a few states have considered them to be an unprotected species in the past. Accidental deaths caused by striking overhead wires and man-made structures are common causes of swan mortality. In rare instances, territorial adult males may kill young cygnets (L. Hindman, Maryland Department of Natural Resources, personal communication) and even rival males during territorial fighting (M. Ciaranca personal communication). Lead poisoning from fish sinkers and spent shotgun shell pellets has been reported in both England and North America (Ciaranca et al 1997). Natural mortality does occur from various waterfowl diseases, parasitic infections, and starvation.

Molting Concentrations

As with all waterfowl, mute swans go through an annual molting process to renew worn flight feathers. Concentrations of birds, consisting of immature, unpaired, and unsuccessful breeders, gather on large open shallow-water areas. These sites provide protection for the flightless birds and a sufficient amount of SAV to sustain them during this period. The molt period occurs between mid-July to late-August, during SAV biomass production. Molt concentrations as large as 500+ birds have been reported in Rhode Island (C. Allin, personal communication) and between 600 to 1,000 birds in Maryland (Maryland Department of Natural Resources).

Wintering distribution

In general, wintering distribution is similar to that of the breeding range. Mute swans are non-migratory in the AF, but may undergo short local seasonal movements seeking open water and available food sources during winter weather. Willey (1968) reported on the seasonal movement of Rhode Island banded mute swans into Massachusetts, Connecticut, and New York. Ciaranca (2000) further noted seasonal movement in southeastern Massachusetts that was related to coastal configurations and the following of watercourses inland.